

**SEMICONDUCTOR DEVICE HAVING A LINER AND METHOD FOR  
FORMING**

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Abstract of the Disclosure

10 An insulating layer (24, 66, 82) is formed over a stack (14) of materials and a semiconductor substrate (12) and an implant is performed through the insulating layer into the semiconductor substrate. In one embodiment, spacers (26) are formed over the insulating layer (24), the insulating layer (24) is etched, and heavily doped regions (36) are formed adjacent the spacers. The spacers (26) are then removed and extension regions (50) and optional halo regions (46) are formed by implanting through the insulating layer (24). In one embodiment, the insulating layer (24) is in contact with the semiconductor substrate (12). In one embodiment, the stack (14) is a gate stack including a gate dielectric (18), a gate electrode (16), and an optional capping layer (22). The insulating layer (24, 66, 82) may include nitrogen, such as silicon nitride and aluminum nitride. In another embodiment, the insulating layer (24, 66, 82) may be hafnium oxide.

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(FIG. 9 to accompany the abstract.)